one must fully discern the fracture configuration in the anterior and posterior lips or columns of the acetabulum. Thus a radiologic examination, including Judet 45 degree iliac and 45 degree obturator oblique views, often supplemented by computerized tomography, is necessary. The appropriate incisions and order of approaches (anterior, posterior or lateral transtrochanteric) may then be planned and reduction and fixation with modern instrumentation and implants can be satisfactorily achieved. A reconstructive surgical repair of an acetabular fracture is not necessarily an emergency procedure; in fact, it is usually advantageous to obtain all the special radiologic studies and analyze them at leisure. An operation should, however, be done within three weeks of the accident, after which time bone union is advancing and reduction becomes very difficult.

Advantages of operative intervention in the treatment of acetabular fractures include being able to remove loose intra-articular fragments, obtain an anatomic reduction and stable internal fixation, facilitate early joint motion, dispense with traction and prolonged bed rest, permit early discharge from hospital, decrease the incidence of degenerative hip disease and facilitate future reconstructive operations if the latter supervene. Disadvantages of the surgical approach to treatment include the possibilities of infection and sciatic nerve injury. An acetabular fracture reconstruction can be lengthy and difficult and should be done by an orthopedic surgeon trained and experienced in such procedures.

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REFERENCES

Letournel E, Judet R: Fractures of the Acetabulum. New York, Springer-Verlag, 1981

Pennal GF, Davidson J, Garside H, et al: Results of treatment of acetabular fractures. Clin Orthop 1980 Sep; 151:115-123

Senegas J, Liorzou G, Yates M: Complex acetabular fractures: A transtrochanteric lateral surgical approach. Clin Orthop 1980 Sep; 151:107-114

Rattlesnake Bites: Current Hospital Therapy

THE TREATMENT of persons bitten by rattlesnakes varies throughout the country. Some authors advocate that all envenomated patients undergo extensive surgical debridement and subfascial exploration. Others believe that even routine surgical procedures are too radical and suggest that antivenin given intravenously is the method of choice. This controversy has raged for many years.

Using a Wick catheter to measure interstitial fluid pressures in subcutaneous and intracompartmental tissues, we developed a laboratory model to better evaluate the effects of venom, antivenin and operative procedures on tissue pressure and destruction. A solution of 3 mg of desiccated crotalid *(Crotalus veridi helleri)* venom that was dissolved in 0.2 ml of normal saline was injected into the anterolateral compartments or subcutaneous space of canine rear legs. The pressure in these tissues was then monitored with Wick catheters and at 48 hours or longer, the dogs were killed and their compartments and tissues were evaluated histologically. From this study, we determined that only with direct intramuscular injection of the venom was there any involvement of the intracompartmental space. A fasciectomy done before the envenomation could help relieve the pressure, but had no effect on muscle destruction, as noted histologically. Conversely, high doses of antivenin modestly reduced the pressure rise, but definitely helped preserve the microscopic viability of the muscle cells.

Because of these studies we began a clinical project wherein all patients bitten by rattlesnakes had Wick catheter pressure determinations before treatment. If the intracompartmental pressures were less than 30 mm of mercury, no operation was recommended. In more than 15 patients evaluated, no surgical procedure was recommended, but high-dose antivenin was given intravenously and all patients responded functionally and systemically. All were in normal condition after three to four days.

Because of the basic science study, correlated with our clinical trial, we now feel there is sound rationale for avoiding surgical intervention and initiating a medical (antivenin) regimen in most patients following rattlesnake envenomation. If clinical evidence of envenomation develops, we initiate antivenin therapy and measure intracompartmental tissue pressure. If pressures measure over 30 to 40 mm of mercury, we recommend fasciotomy to reduce any additional insult to the compartment contents by the elevated pressure—an effect separate from that of the venom. In all cases, envenomated patients should receive antivenin of four to five vials per hour for adults and up to eight to ten vials per hour for small children. If a bite is subcutaneous and muscular involvement is minimal, we feel surgical decompression is unwarranted. To date we have cared for more than 700 persons envenomated by rattlesnakes,

with only one requiring surgical decompression. No neurologic or functional deficits have developed with this treatment regimen.

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REFERENCES

Garfin SR, Castilonia RR, Mubarak SJ, et al: Role of surgical decompression in treatment of rattlesnake bites. Surg Forum 1979; 30:502-504

Garfin SR, Mubarak SJ, Davidson TM: Rattlesnake bites: Current concepts. Clin Orthop 1979 May; 140:50-57

Russell RE: Snake Venom Poisoning. Philadelphia, JB Lippincott, 1980

Spinal Stenosis

THE ORIGIN OF SPINAL STENOSIS can be developmental, degenerative or a combination of both. In developmental stenosis there is a decreased interpedicular distance and a shortening of the pedicles, reducing the anteroposterior diameter of the canal. In the degenerative type, patients have canals of normal dimensions that become stenotic due to hypertrophic facets and lamina, posterolateral vertebral body osteophytes, disc herniation, ligament hypertrophy or spondylolisthesis. The stenosis can be in the central canal, the lateral recesses or at the intervertebral foramina.

Men are more commonly affected than women and the age of onset is usually in the fourth or fifth decade; however, it is seen in patients of all ages. Patients usually have both back and leg pains. About 40 percent will have pain in both legs that may be radicular. More often the leg pains are characterized by intermittent claudication, with patients describing a pain or heaviness in their legs, with or without muscle weakness, after walking a short distance. With a short period of rest the leg symptoms resolve, only to return again after an equally short distance of walking. These leg problems can be differentiated from a vascular origin by Doppler examination, electromyographic studies, bicycle exercise testing and arteriography.

On physical examination most patients are found to have absent reflexes and sensory and motor defects, but relatively few (less than 25 percent) have a positive result on straight-leg raising or Laséque's test. With stenosis, if these test findings are positive, they will usually be positive bilaterally.

Narrowing of the canal and hypertrophy or subluxation (or both), which strongly suggest the diagnosis, can be seen on plain roentgenograms. The newer generation of computerized tomography scanners with their improved resolution have been very helpful in the more difficult cases. Myelography studies will show posterior or lateral defects or an hourglass deformity at one or more levels and may show narrowing of the dural sac.

The only effective therapy is surgical decompression. It is important to be aware that in many cases the nerve compression is lateral under the hypertrophied facets. The laminectomy must extend laterally to decompress the nerve roots as far as the intervertebral foramina. This is accomplished by an undercutting partial facetectomy at all levels where preoperative studies have shown compression to be present.

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REFERENCES

Getty CJ: Lumbar spinal stenosis: The clinical spectrum and the results of operation. J Bone Joint Surg [Br] 1980 Nov; 62-B (4):481-485

Kirkaldy-Willis WH, Wedge JH, Yong-Hing K, et al: Pathology and pathogenesis of lumbar spondylosis and stenosis. Spine 1978 Dec; 3(4):319-328

Verbiest H: Stenosis of the lumbar vertebral canal and sciatica. Neurosurg Rev 1980; 3(1):75-89

Vascularized Bone Grafts

VASCULARIZED GRAFTS of living bone offer an advantage over conventional nonvascularized grafts in that more osteocytes will survive and thus more rapid healing of bone will occur. Bone can be transferred as part of a composite tissue flap, along with skin and fat, and nourished by an attached vascular pedicle. The most common flap used in this manner is the groin flap, with a portion of the iliac crest nourished by the superficial or deep circumflex iliac artery and veins. Only relatively small defects can be covered by this type of flap and it cannot be transferred to the leg in a single stage except as a free flap.

Free vascularized bone grafts for defects in long bones caused by tumor or trauma have been possible with the development of microvascular surgical techniques. A recent review of the role of vascularized grafts in bone grafting has shown that for defects less than 6 cm conventional autogenous bone grafting techniques will generally work satisfactorily. For defects larger than 6 cm vascularized grafts are more satisfactory than conventional techniques.

The most suitable donor bone for long bone defects is the fibula. This bone is transferred on a vascularized pedicle of the peroneal artery and accompanying venae comitantes. Attached peroneus brevis muscle and overlying skin can also be transferred with this flap if needed as a functional motor and if the nerve supply to the